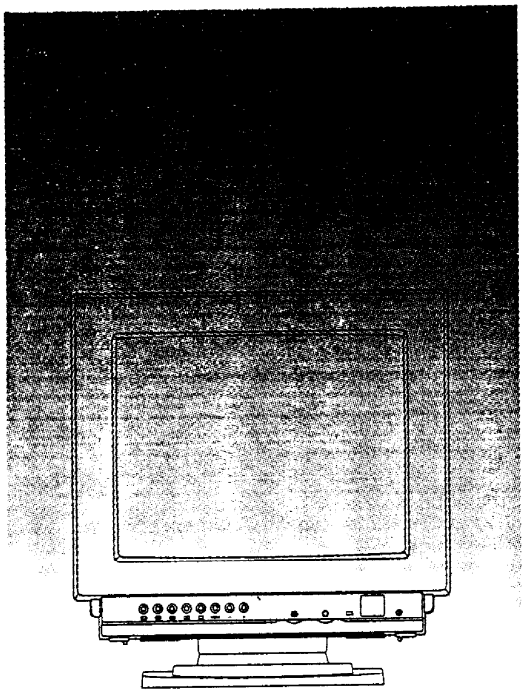
SAMSUNG

COLOR MONITOR

CSN5987

SERVICE Manual

COLOR MONITOR



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SPECIFICATION

Classification	Specifications
Picture Tube	15-inch (14" Visual) FST (Full Square/Flat face Tube), 90° deflection, 0.28 mm Dot pitch, Semi-tint, Glare.
Scanning Frequency Horizontal / Vertical	30 kHz to 50 kHz (Automatic)/50 Hz to 100 Hz (Automatic)
Display Colors Analog Input	Unlimited Colors
Maximum Resolution Horizontal Vertical	1024 Dots 768 Lines
Active Display Size	260 mm ±3 mm /195 mm ±3 mm (Active display size is changed by signal timing)
Input Signal Video Signal Separate Sync Composite Sync Sync on Green	Analog 0.714 Vp-p Positive at 75 Ω Terminated TTL Level, Positive or Negative TTL Level, Positive or Negative Composite Sync, 0.286 Vp-p Negative (Video 0.714 Vp-p Positive)
Video Band Width	65 MHz (MAX.)
Power Supply Power consumption	AC 90-132 Volt, 60 Hz ±3 Hz 90 Watts (MAX.)
Dimensions Unit (HxWxD) Carton (HxWxD)	15.2 x 14.6 x 15.6 Inches (385 x 370 x 395 mm) 17.7 x 18.3 x 19.5 Inches (450 x 465 x 495 mm)
Weight Net Gross	29.8 Lbs (13.5kg) 33.7 Lbs (15.3kg)
Environmental Considerations Operating Temperature Humidity Storage Temperature Humidity	32° F to 104° F (0° C to 40° C) 10% to 80% -4° F to 113° F (-20° C to 45° C) 5% to 95%

NOTE : DESIGNS and SPECIFICATIONS are subjected to change without prior NOTICE.

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SAFETY PRECAUTIONS

Service work should be performed only by qualified service technicians who are thoroughly familiar with all of the following safety checks and servicing guidelines:

1. Warning

1) For continued safety, do not attempt to modify the circuit.
2) Disconnect the AC power before servicing.
3) Semiconductor heat sinks are potential shock hazards when the chassis is operating.

2. Servicing the High Voltage System and Picture Tube

When servicing the high voltage system, remove the static charge by connecting a 10kohm resistor in series with an insulated wire (such as a test probe) between the chassis and the anode lead. (The AC line cord should be disconnected from the AC outlet.)

1) The picture tube in this display monitor employs integral implosion protection.
2) Replace with a tube of the same type and number for continued safety.
3) Do not lift the picture tube by the neck.
4) Handle the picture tube only when wearing shatterproof goggles and after discharging the high voltage anode completely.

3. X-Radiation and High Voltage Limits

1) Be sure all service personnel are aware of the procedures and instructions covering X-radiation. The only potential source of X-ray in a current solid state display monitor is the tube. However, the picture tube does not emit measurable X-ray radiation if the high voltage is as specified in the "high voltage check" instruction. It is only when high voltage is excessive that X-radiation is capable of penetrating the shell of the picture tube, including the lead in glass material. The important precaution is to keep the high voltage below the maximum level specified.

2) It is essential that serviceman have available at all times an accurate high voltage meter. The calibration of this meter should be checked periodically.

3) High voltage should always be kept at the rated value-no higher. Operation at high voltages may cause a failure of the picture tube or high voltage circuitry and, also under certain conditions, may produce radiation in excess of desirable levels.

4) When the high voltage regulator is operating properly, there is no possibility of an X-radiation problem. Every time a color chassis is serviced, the brightness should be tested while monitoring the high voltage with a meter to be certain that the high voltage does not exceed the specified value and that it is regulating correctly.

5) Do not use a picture tube other than that specified, or make unrecommended circuit modifications to the high voltage circuitry.

6) When troubleshooting or taking test measurements on a display monitor with excessively high voltage, avoid being unnecessarily close to the display monitor. Do not operate the display monitor longer than is necessary to locate the cause of excessive voltage.

4. Fire and Shock Hazard

Before returning the display monitor to the user, do the following safety checks:

1) Inspect all lead dress to be certain that the leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the display monitor.

2) Inspect all protective devices such as nonmetallic control knobs, insulating materials, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacitor networks, mechanical insulators, etc.

3) To be sure that no shock hazard exists, checks for leakage current in the following manner:

① Plug the AC line cord directly into a 120 volt AC outlet. (Do not use an isolation transformer for this test)
② Using two clips leads, connect a 1.5 kohm, 10 watt resistor paralleled by a 0.15uF capacitor in series with all exposed metal cabinet parts and a known earth ground, such as electrical conduit or electrical ground connected to earth ground.
③ Use a SSVM or VOM with 1000 ohms per-volt or higher sensitivity to measure the AC voltage drop across the resistor. (See Figure 1.)

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④ Connect the resistor to all exposed metal parts having a return path to the chassis (metal cabinet, screw heads, knobs and shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor.

⑤ Any reading of 5.25 volts RMS (this corresponds to 3.5milliampere AC) or more is excessive and indicates a potential shock hazard which must be corrected before returning the display monitor to the user.

5. Product Safety Notices

Some electrical and mechanical parts have special safety-related characteristics which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by ⚠ on schematics and parts lists. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire and/or other hazards. Product safety is under review continuously and new instructions are issued whenever appropriate.

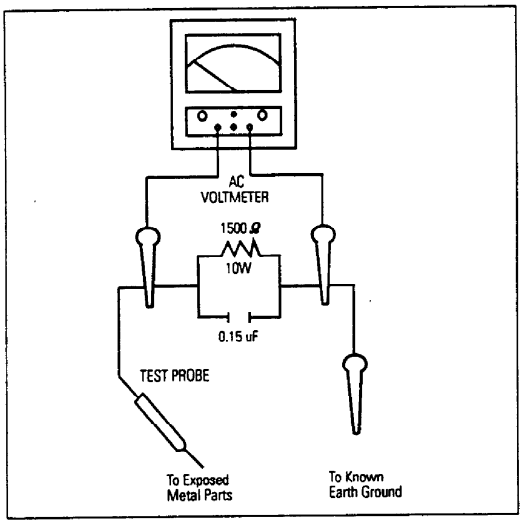

Figure1. Leakage Current Test Circuit

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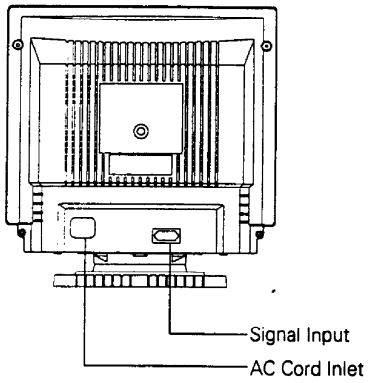
1. Features

1) 15-inch (14-inch visual) high performance CRT.
   - 0.28 mm dot pitch.
2) Glare CRT face treatment helps reduce eyestrain.
3) Automatically scans horizontal frequencies from 30-50 kHz, and vertical frequencies from 50-100 Hz.
4) Compatible with a variety of video standards including IBM VGA, XGA, super-VGA, and 1024x768 non interlaced and Apple.
5) Supports VESA flicker-free modes.
6) Microprocessor based digital control system saves up to 10 user definable display settings. Also, includes 11 factory preset display settings.
7) Power supply operates on AC 100-120 Volt, 60 Hz for use all over the world.
8) Your display has been designed to operate on all power systems, including "IT" power systems.
9) Power management system:
   Power management circuit, when signaled by the computer system, will reduce power consumption when the computer system is not in use.
10) Optional Feature:
    Please consult your dealer for information about these optional features.
11) Apple Macintosh Connector Adapter:
    Connector adapters are available for connecting this monitor to the Apple MacintoshII family, the Macintosh LC/LCII, and the Quadra series computers.

2. Installation



This monitor can be connected to any IBM compatible analog display adapter. Such adapters include VGA, XGA, XGAII and the built-in video system of IBM PS/2 computers.

To set up your display, follow these steps:

1) Be sure your computer is turned off.
2) Place the display on a flat, sturdy surface.
3) Connect the 15-pin D-sub connector on the video connector cable to the video connector on your computer and tighted the attachment screws. (Refer to the setting up manual for your computer for the location of the video connector.)
4) Connect the 9-pin D-sub connector on the video connector cable to the video connector at the back of the display and tighten the attachment screws.
5) Connect the power cable to the display and then plug the power cord into the power outlet.
6) Adjust the screen tilt and swivel to suit your needs.
7) Turn on your computer and then the display.

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3. CONNECTION TO YOUR COMPUTER (MACINTOSHII FAMILY)

With the cable adapter, this monitor is compatible with Apple MacintoshII family, Macintosh LC/LCII/LCIII, Centris, and Quadra series computers.
(Please see Page 3-5 for the pin assignments.)

To attach the monitor to your system, follow these instructions:

1) Turn off the power to the monitor and computer.

2) Connect the cable adapter to the video output port of your video controller. Tighten the screws on the cable adapter.

3) Connect the 9-pin side of the signal cable to the 9-pin D-sub connector on the rear side of the monitor.

4) Connect the 15-pin side of the signal cable to the other end of the cable adapter. Tighten the screws of the signal cable to ensure proper connection.

5) Connect one end of the power cable to the monitor and the other end to the power outlet.

6) Turn on the monitor and the computer.

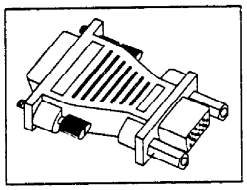


Fig. 1. Cable Adapter

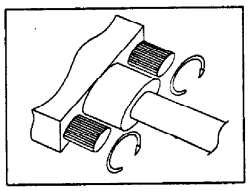


Fig. 2. Screw of the Signal Cable

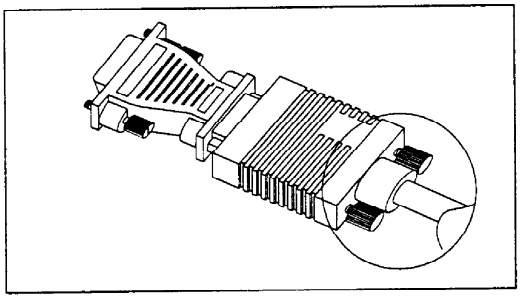
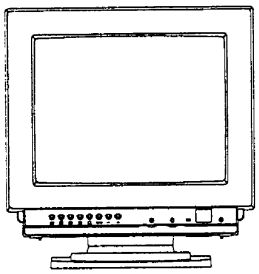
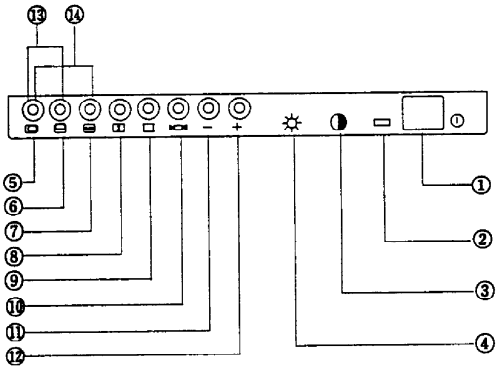


Fig. 3. Cable Adapter Installing Diagram

4. Control Location & Functions

4-1. Front View





1	Power Switch (PUSH)
2	Power Indicator
3	Contrast Control
4	Brightness Control
5	Horizontal Position Control
6	Vertical Position Control
7	Horizontal Size Control
8	Vertical Size Control
9	Side Pincushion Control
10	Recall Control
11	Down Control
12	Up Control
13	Parallelogram Control
14	Trapezoid Control

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4-2. Basic Controls and LED Indicator Functions

1) Power switch:

Use to turn monitor power on and off. Push the power switch once to turn monitor power on. Power LED on indicator will also turn on. Push the switch again to turn monitor power off.

2) Power indicator (Dual color):

(Green/ Orange) The power indicator shows the state of your monitor.
- When the monitor is operated normally, the indicator LED becomes green.
- When the monitor is operated specially, the indicator LED becomes orange

3) Contrast control:

Use to adjust the contrast level of the displayed image. Contrast controls the difference between dark and light areas of the displayed image.

4) Brightness control:

Use to adjust the overall brightness of the displayed image.

Microprocessor Controls and Functions

General Description

The monitor has preset display settings for each of the standard signal timings listed on the timing chart. In other words, the monitor will automatically adjust itself to an optimum size and position when it senses one of the standard signal timings. However, some users wish to adjust the monitor to their preferred swtting rather than the factory preset. The microprocessor controlled adjustments will automatically memorize the display settings that you prefer for a specific signal timing and automatically adjust itself when the monitor senses that signal See Pages 5-1, 5-2 for the standard signal timing chart.

Control Function Buttons

Use these buttons to select adjustment functions. Press the desired function button once to select adjustment functions, and the power indicator's color is changed from green to orange. If the power indicator's color becomes orange you can use the Down (-) or Up (+) button to adjust the displayed image, but no adjustment is made when the indicator's color returns to green after about ten seconds.

5) Horizontal position control:

Use this button to adjust the horizontal position (centering) of the display.

6) Vertical position control:

Use this button to adjust the vertical position (centering) of the display.

7) Horizontal size control:

Use this button to adjust the horizontal size (width) of the display.

8) Vertical size control:

Use this button to adjust the vertical size (height) of the display.

9) Side pincushion control:

Use this button to correct vertical sides of the display from bowing out or in.

10) Recall:

Use this button to recall factory preset settings. If you push the recall button the indicator LED's color is changed from green to orange. Keep pressing the Recall button for 2-3 seconds until the indicator LED's color is changed from orange to green in order to recall the factory preset data for the standard signal.

Caution: This operation also resets the data in the user preset memory area and erases the data you have stored.

About burn-in mode: You can operate or disable power saving function if you need. In no signal state (video cable is disconnected from this monitor), the indicator's color is orange. Push horizontal position button, the power saving function is disabled and then you can warm up this monitor. This burn-in mode is removed when the power of monitor is off and on again.

Adjustment Buttons

Use these buttons to adjust the displayed image when a control function is enabled (the indicator's color is orange). But you cannot adjust the displayed image when a control function is disabled (the indicator's color is green).

Note: After 3-4 seconds from the last control using the Up or Down button, your preferred display adjustments are saved automatically, and then the indicator's color is changed to green and returned to orange.

Caution: The control range of a function except Vertical Position is subject to be restricted by programing of microprocessor in this monitor.

11) Down control:

— Use this button to decrease the value of a function.

12) Up control:

\+ Use this button to increase the value of a function.

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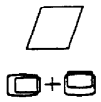
Technical Description
This monitor has some technical control functions for the correction of geometric distortion.

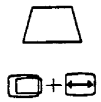
13) Parallelogram control:



- Keep pressing the horizontal position button and the vertical position button simultaneously for 4-5 seconds until the indicator's color is changed from green to orange.

- Use the Up or Down button to control the parallelogram of the display.

14) Trapezoid control:



- Keep pressing the horizontal position button and the horizontal size button simultaneously for 4-5 seconds until the indicator's color is changed from green to orange.

- Use the Up or Down button to control trapezoid (keystone) of the display.

6. Power Management System (Power Saving Function)

If your computer system features a display power management function, this monitor, when signaled, will enter power saving modes. The purpose of power management is to automatically reduce power consumption when the computer system is not in use. This monitor can enter 3 different power saving modes as described below.

Note 1: This monitor is Energy Star Compliant when used with a Computer equipped with DPMS (VESA).

Table 1: Display Power Management Signaling(DPMS) standard

State / Sync	Normal Operation	Power Saving Function Mode		
		Stand-by Mode	Suspend Mode	Power Off Mode
Horizontal	Active	Inactive	Active	Inactive
Vertical	Active	Active	Inactive	Inactive
Video	Active	Blanked	Blanked	Blanked
Remark (LED color)	Green	Orange	Orange/Green Blinking (0.5 sec. interval)	Orange Blinking on-off (1 sec. interval)
Power Consumption	90W (Max.)	72W (Max.)	Less than 20 W	Less than 5 W

Note 2: This monitor automatically returns to normal operation state when horizontal and vertical sync returns. When you turn power off in power off mode, LED's indicator may continuously blink on-off for 4 to 5 seconds.

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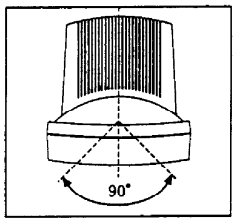
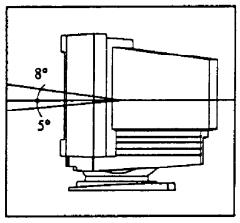
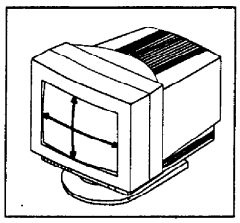
7. Use of the Tilt-Swivel

With the tilt-swivel, this unit can be adjusted to be viewed at your desired angle within 90° horizontally and 13° vertically. To turn the unit horizontally, hold it at the bottom with both your hands as illustrated below.







8. Pin Assignments

Sync Type / Pin No.	9 Pin Side of the Signal Cable (Figure 1)			15 Pin Side of the Signal Cable (Figure 2)			Cable Adapter (Figure 3)
	Separate	Composite	Sync on green	Separate	Composite	Sync on green	Apple MACII
1	Red	Red	Red	Red	Red	Red	Gnd-R
2	Green	Green	Green+Sync	Green	Green	Green+Sync	Red
3	Blue	Blue	Blue	Blue	Blue	Blue	H/V-Sync
4	H-Sync	H/V-Sync	Not Used	Gnd	Gnd	Gnd	Sense 0
5	V-Sync	Not Used	Not Used	NC	NC	NC	Green
6	Gnd-R	Gnd-R	Gnd-R	Gnd-R	Gnd-R	Gnd-R	Gnd-G
7	Gnd-G	Gnd-G	Gnd-G	Gnd-G	Gnd-G	Gnd-G	Sense 1
8	Gnd-B	Gnd-B	Gnd-B	Gnd-B	Gnd-B	Gnd-B	Reserved
9	Gnd-Sync	Gnd-Sync	Gnd-Sync	NC	NC	NC	Blue
10	-	-	-	Gnd-Sync	Gnd-Sync	Gnd-Sync	Sense 2
11	-	-	-	Gnd	Gnd	Gnd	Gnd
12	-	-	-	NC	NC	NC	V-Sync
13	-	-	-	H-Sync	H/V-Sync	Not Used	Gnd-B
14	-	-	-	V-Sync	Not Used	Not Used	Gnd
15	-	-	-	NC	NC	NC	H-Sync

Note: "NC" means no connection

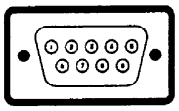


Figure 1: Male Type

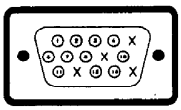


Figure 2: Male Type

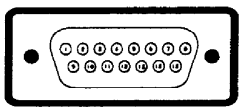


Figure 3: Male Type

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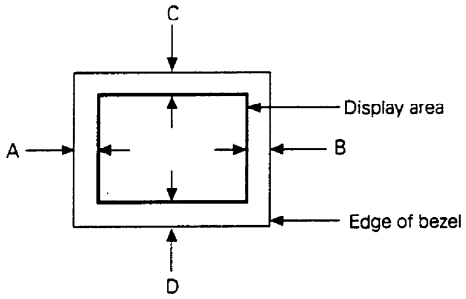
DISPLAY PERFORMANCE

1. Display Area

1) Width : 260 ±3 mm
2) Height : 195 ±3 mm

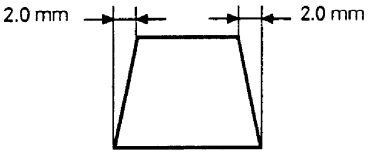
2. Centering

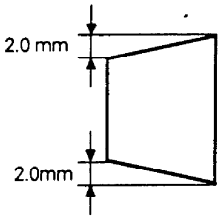
| A - B | ≤ 4.0 mm
| C - D | ≤ 4.0 mm



3. Distortion

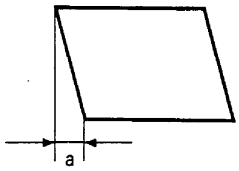
1) Trapezoid





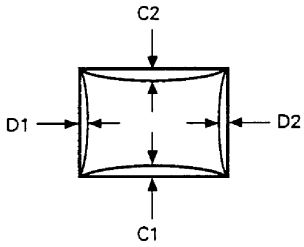
2) Parallelogram

| a | ≤ 2.0 mm



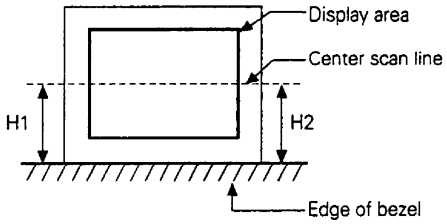
3) Pincushion

| C1 |, | C2 | ≤ 2.0 mm
| D1 |, | D2 | ≤ 2.0 mm



4) Rotation

| H1 - H2 | ≤ 2.0 mm



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4. Linearity

1) Standard Mode : 48kHz/72Hz

Horizontal Linearity (HL) :

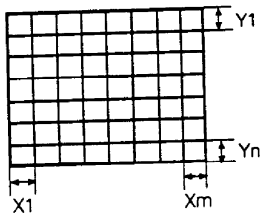
$$\frac{Xmax - \overline{X}}{\overline{X}} \times 100 \text{ or } \frac{\overline{X} - Xmin}{\overline{X}} \times 100 \leq 5\%$$

Vertical Linearity (VL) :

$$\frac{Ymax - \overline{Y}}{\overline{Y}} \times 100 \text{ or } \frac{\overline{Y} - Ymin}{\overline{Y}} \times 100 \leq 5\%$$

2) Other Modes

HL, VL ≤ 7% for other mode: VGA, 8514A, 36kHz,



m=16
n =12

3) Conditions

Display image: Crosshatch pattern
Maximum and minimum values should not be adjacent to each other.

Xmax is maximum value among X1 ~ Xm
Xmin is minimum value among X1 ~ Xm

$$\overline{X} = \frac{X1 + X2 ..... Xm}{m} \quad (m=16)$$

Ymax is maximum value among Y1 ~ Yn
Ymin is minimum value among X1 ~ Yn

$$\overline{Y} = \frac{Y1 + Y2 ..... Yn}{n} \quad (n=12)$$

5. Brightness Uniformity

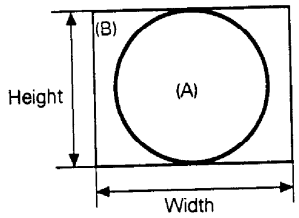
Value	70% (Min) Variation = $\frac{B}{A}$
Conditions	Display Image: White flat field Luminance : 20 F/L at the center of display area A: Luminance at position of the highest B: Luminance at position of lowest brightness

6. Color Point

Value	9300° K X = 0.283 ± 0.02, Y = 0.298 ±0.02
Conditions	Display Image : White flat field at the center of display area. Luminance Min: 5 fL, Max: 20 fL

7. Misconvergence

Center area of display ("A" circle is 195 mm (A): 0.3 mm
Peripheral area of display (B): 0.4 mm



1) Conditions
Display Image : Crosshatch pattern mixed with R,G,B colors.

8. Purity

Conspicuous mislanding shall not be visible within display area at distance of 50 cm from CRT surface

1) Conditions
Display image: White flat field
Luminance : 15 f/L at the center of display area.

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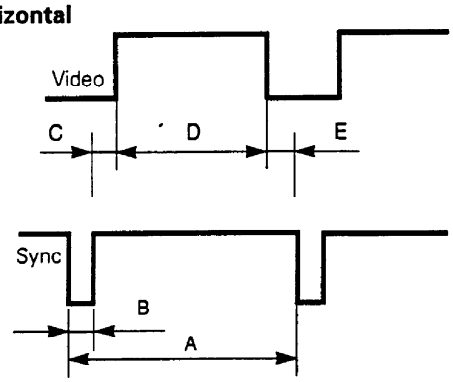
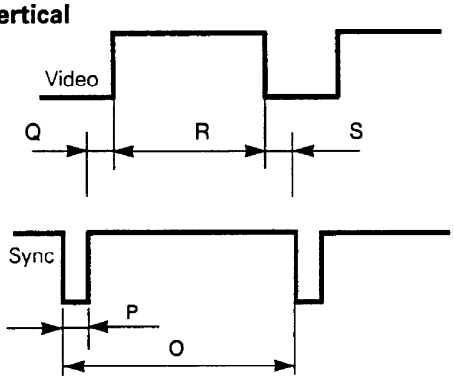
SIGNAL TIMING CHART

Mode / Timing	IBM				VESA
	VGA1/70	VGA2/70	VGA3/60	XGA/87i	640/72
	640X350	720X400	640X480	1024X768	640x480
fH (kHz)	31.469	31.469	31.469	35.522	37.861
A μsec	31.778	31.777	31.778	28.151	26.413
B μsec	3.813	3.813	3.813	3.920	1.270
C μsec	1.907	1.907	1.907	1.247	4.064
D μsec	25.422	25.422	25.422	22.806	20.317
E μsec	0.636	0.636	0.636	0.178	0.762
fv (Hz)	70.086	70.087	59.940	86.958	72.809
O msec	14.268	14.268	16.683	11.500	13.735
P msec	0.064	0.064	0.064	0.113	0.079
Q msec	1.907	1.080	1.048	0.563	0.739
R msec	11.122	12.711	15.253	10.810	12.678
S msec	1.176	0.413	0.318	0.014	0.237
Clock Fre. (MHz)	25.175	28.322	25.175	44.900	31.500
Polarity					
H. Sync.	Positive	Negative	Negative	Positive	Negative
V. Sync.	Negative	Positive	Negative	Positive	Negative
Remark	—	—	—	Interlaced	—

Horizontal



Vertical



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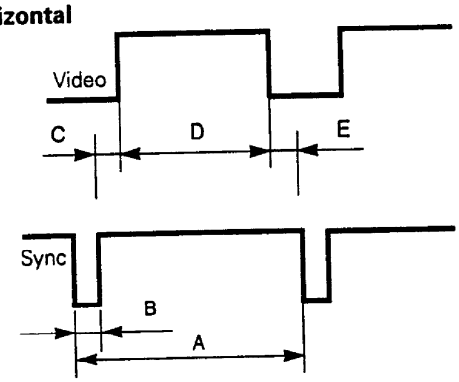
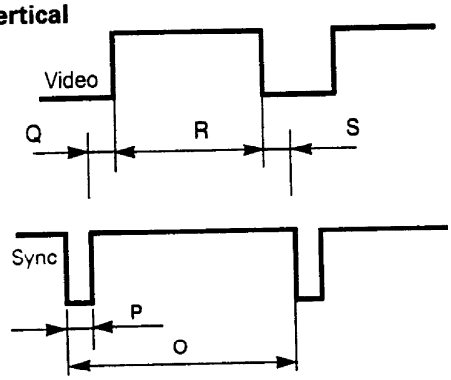
SIGNAL TIMING CHART

Mode / Timing	VESA				Apple Mac.	
	800/56	800/60	800/72	1024/60	640/67	832/75 Hz
	800x600	800x600	800x600	1024x768	640x480	832x624
fH (kHz)	35.156	37.879	48.077	48.363	35.000	49.726
A μsec	28.444	26.400	20.800	20.677	28.571	20.110
B μsec	2.000	3.200	2.400	2.092	2.116	1.117
C μsec	3.556	2.200	1.280	2.462	3.175	3.910
D μsec	22.222	20.000	16.000	15.754	21.164	14.524
E μsec	0.667	1.000	1.120	0.369	2.116	0.559
fv (Hz)	56.250	60.317	72.188	60.004	66.667	74.551
O msec	17.778	16.579	13.853	16.666	15.000	13.414
P msec	0.057	0.106	0.125	0.124	0.086	0.060
Q msec	0.626	0.607	0.478	0.600	1.114	0.784
R msec	17.067	15.840	12.480	15.880	13.714	12.549
S msec	0.028	0.026	0.770	0.062	0.086	0.020
Clock Fre. (MHz)	36.000	40.000	50.000	65.000	30.240	57.284
Polarity						
H. Sync.	Pos./Neg.	Positive	Positive	Negative	Negative	Negative
V. Sync.	Pos./Neg.	Positive	Positive	Negative	Negative	Negative
Remark	—	—	—	—	—	—

Horizontal



Vertical



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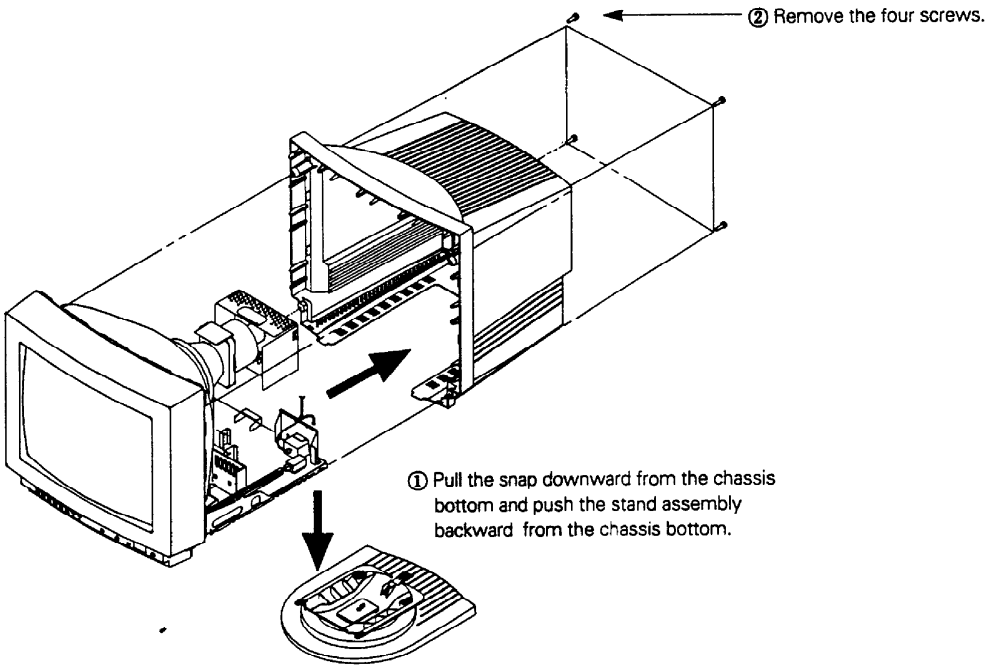
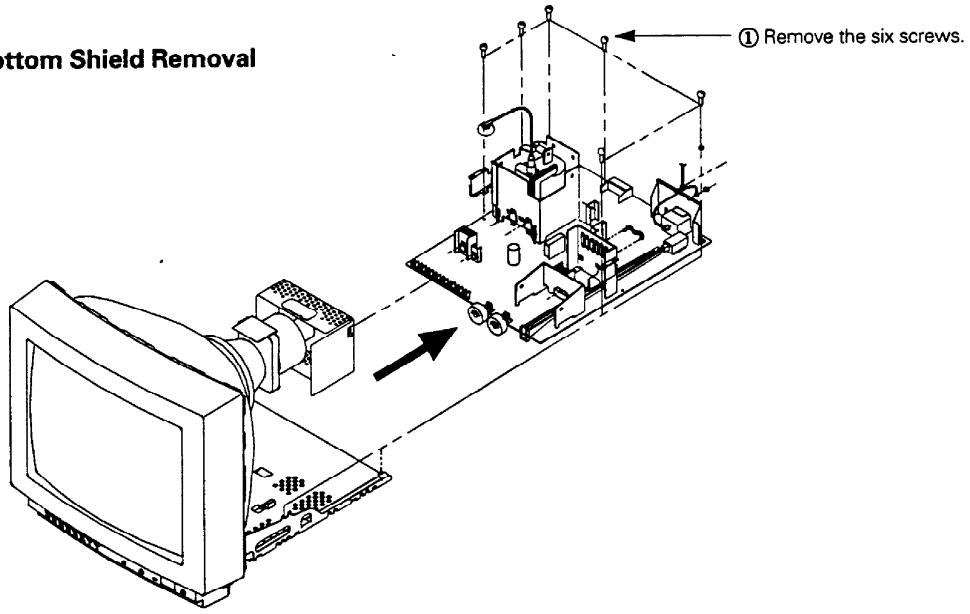
DISASSEMBLY

5-1. Stand & Cabinet Removal


② Remove the four screws.
① Pull the snap downward from the chassis bottom and push the stand assembly backward from the chassis bottom.

5-2. Bottom Shield Removal



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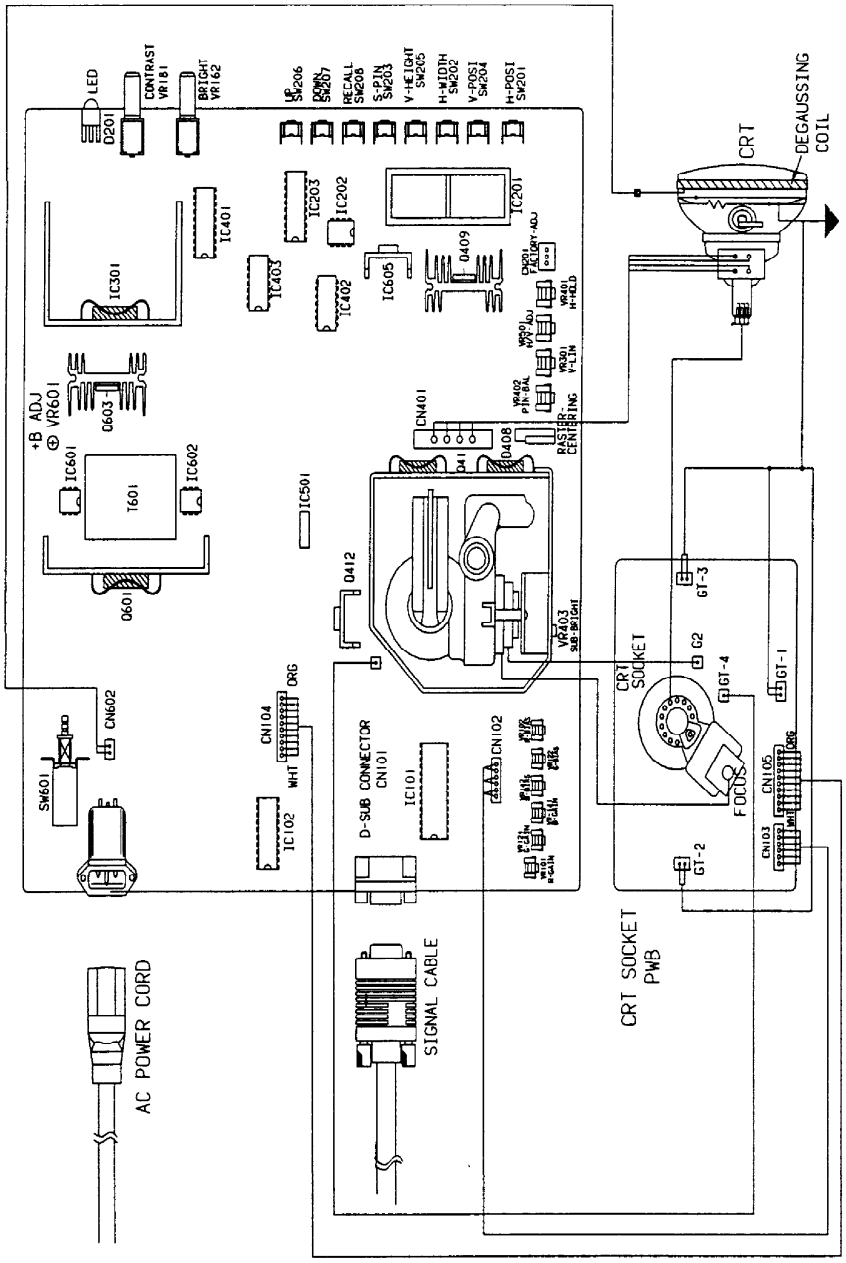
WIRING DIAGRAM



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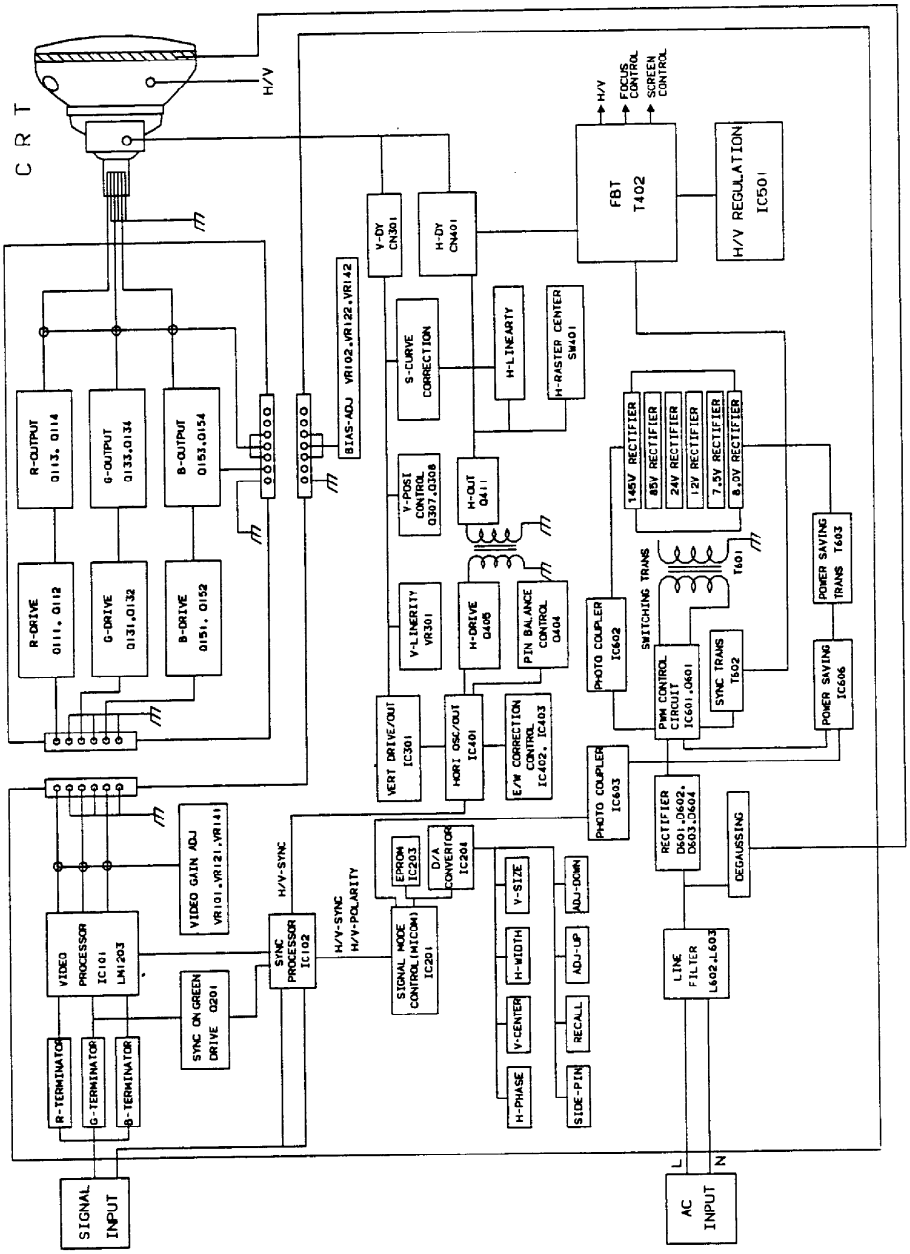
BLOCK DIAGRAM



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ALIGNMENT PROCEDURE

1. Adjustment Conditions and Precautions

1) Power supply voltage
AC 120 volt (60 Hz)

2) Warm up time
The display must be on for 30 minutes before starting alignment. This is especially critical in color temperature and white balance adjustments.

3) Signal
Video analog 0.714 Vp-p positive at 75 ohm terminated.

Sync on green	:	Video 0.714 Vp-p positive.
	:	Sync 0.286 Vp-p negative.
Sync	:	TTL level negative / positive separate , composite.

4) Scanning Frequency

Horizontal	:	30 kHz - 50 kHz (Automatic).
Vertical	:	50 Hz - 100 Hz (Automatic).

✱ Unless otherwise specified, adjust at SVGA (fH : 48kHz, fv: 72Hz) signals.

CAUTION

☞ Alignment procedure without micom control jig: You can do adjust this step after set the monitor to the burn-in mode. (Refer Page 3-3)

☞ Alignment procedure with micom control jig: Before doing below steps,

① To apply standard timing (800X600/72 Hz) to a monitor.
② Press a button #⑳ (Memory Data Dump) on the Micom control jig to call the data of the all mode based 800X600/72 Hz.
③ Please refer to block diagram of the Micom control jig on the Page 9-3.

2. Main PWB Prepare Adjustment

1) +B 145V Line adjustment
Adjust VR601 to be 145 ±1 V DC at D622 cathode and GND.
(No Beam Contrast: Min., Brightness: Min.)

2) High Voltage Control
Adjust VR402 to be 25 kV ±0.2 kV.
(No Beam Contrast: Min., Brightness: Min.)

3. Main PWB Adjustment

- Unless otherwise specified, adjust the EXT-VR
Contrast : Max. (Fully clockwise)
Brightness : So that no background raste appears.

1) Horizontal Hold
Connect the plus pole of the scope probe to RED wire jacket of DY and the minus pole to chassis frame.
At self raster (disconnect the signal cable), adjust the horizontal frequency control (VR401) so that the horizontal frequency is 48 kHz.
(Free running frequency: 48 kHz ±0.1 kHz)

2) Vertical Linearity
Adjust VR301 so that vertical linearity is optimum when signal of 48 kHz is applied.

3) Horizontal Raster Center
Adjust SW401 so that back raster position to come center when signal of 48 kHz/72 Hz is applied.

4) Horizontal Position Adjustment
- Adjustment procedure without micom control jig:
After pushing the Horizontal Position button, push Up button or Down button so that the image (or the test pattern) is placed on the center of the raster.

- Adjustment procedure with micom control jig:
Push Horizontal Position Up button (#② button on the Micom Control Jig) or Horizontal Position Down button (#① button) so that the image (or the test pattern) is placed on the center of the raster.

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5) Vertical Position Adjustment

- Alignment procedure with micom control jig:

Push Vertical Position Up button (#⑦ button) or Vertical Position Down button (# ⑧ button) so that the vertical image or pattern is placed on the center of the raster.

6) Horizontal Size Adjustment

- Adjustment procedure without micom control jig:

After pushing the Horizontal Size button push Up button or Down button so that the horizontal width of the displayed pattern is 260 mm.
(The tolerance is ±3 mm)

- Adjustment procedure with micom control jig:

Push Horizontal Size Up (#④ button) or Horizontal Size Down button (#③ button) so that the horizontal width of the displayed pattern becomes 260 mm.
(The tolerance is ±3 mm)

7) Vertical Size Adjustment

- Alignment procedure without micom control jig:

After pushing the Vertical Size push Up button or Down button so that the Vertical Size of the displayed pattern is 195 mm.
(The tolerance is ±3 mm)

- Adjustment procedure with micom control jig:

Push Vertical Size Up button (#⑨ button) or Vertical Size Down (#⑩ button) so that the vertical image or pattern becomes 195 mm.
(The tolerance is ±3 mm)

8) Side Pincushion Adjustment

- Alignment procedure without micom control jig:

After pushing the Side Pincushion button, push Up button or Down button so that each side of the pattern (or the image) becomes straight.

- Adjustment procedure with micom control jig:

Push Side Pincushion Up button (#⑤ button) or Side Pincushion Down button (#⑥ button) so that each side of the pattern or image becomes straight.

9) Parallelogram Adjustment

- Alignment procedure without micom control jig:

Keep pressing the Horizontal Position button and Vertical position button simultaneously for 4-5 seconds until the indicator's color is changed from orange to green. Use the Up or Down button to control parallelogram of the display.

- Adjustment procedure with micom control jig:

Push Parallelogram Up button (#⑬ button) or Parallelogram Down button (#⑭ button) so that the image or pattern becomes to rectangular.

10) Trapezoid Adjustment

- Alignment procedure without micom control jig:

Keep pressing the Horizontal Position button and Horizontal Size button simultaneously for 4-5 seconds until the indicator's color is changed from green to orange. Use the Up or Down button to control trapezoidal (keystone) of the display.

- Adjustment procedure with micom control jig:

Push Trapezoidal Up button (#⑪ button) or Trapezoidal Down button (#⑫ button) so that the image or pattern becomes to rectangular.

11) To save the picture data to a monitor

- Alignment procedure with micom control jig:

To save the picture data of a mode, push Standard Save button. (#⑲ button on the Micom control)

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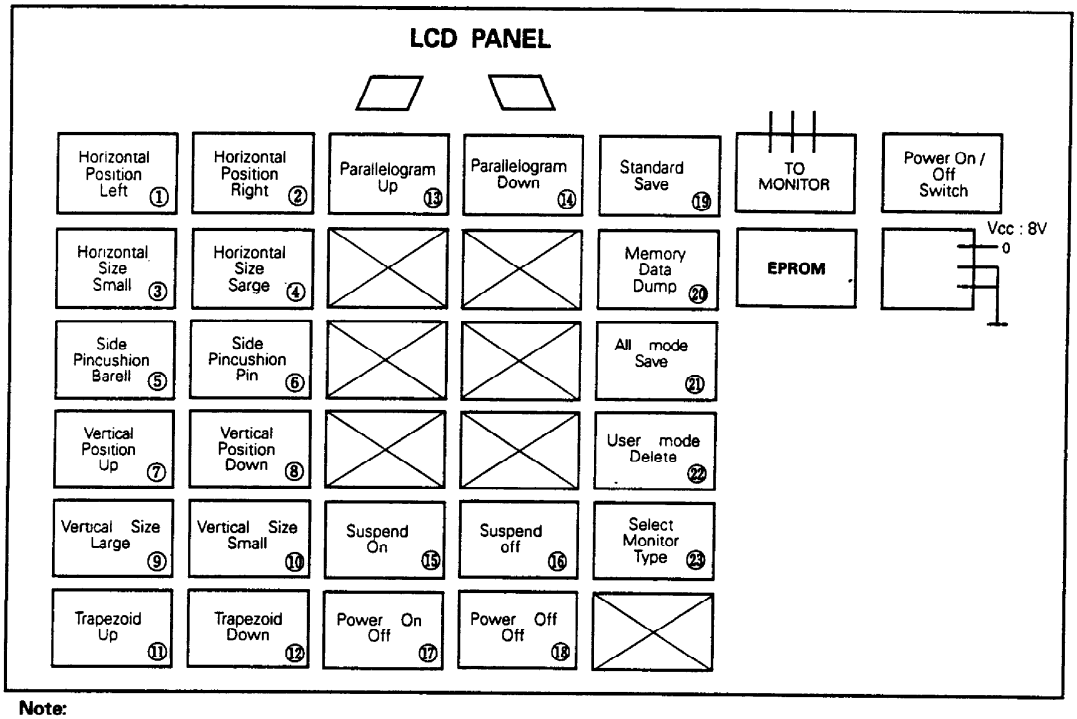
The Block Diagram of the Micom control Jig (Alignment Procedure with micom control jig)



Note:

1) Standard save button (#⑲ button)
   - To save the picture data of a mode individually.
2) All mode save button (#㉑ button)
   - To save the picture data of all mode (13 modes) referring standard mode (1024x768/72Hz).
3) Memory dump button (#⑳ button)
   - To call the standard picture data from EPROM on the Micom Control Jig.
4) User delete button (#㉒ button)
   - To delete the data in the user mode. (Saved by a user)
5) Select monitor type button (#㉓ button)
   - To select the picture data which be dumped from EPROM on the Micom Control Jig by a CRT. Keep pressing for 2 seconds.
6) Suspend mode test button (#⑮, #⑯ buttons)
   - To test the suspend function among the power management function.
   - Push suspend on button (#⑮ button), then the monitor becomes to suspend mode.
   And push suspend off button (#⑯ button), then the monitor returns to normal operation status.
7) Power-Off mode test button (#⑰, #⑱ buttons)
   - To test the Power-Off function among the power management function.
   - Push Power-Off On button (#⑰ button), then the monitor becomes to Power-Off mode, and push Power-Off Off button (#⑱ button), then the monitor returns to normal operation status.

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4. Adjustment of Video PWB

Note: Before performing this adjustment procedure, check that the video signals are as follows.

Video : Analog 0.714 Vp-p (at 75Ω Terminated).
SYNC : Synchronizing : Separate TTL level.
Unless otherwise specified,
use signal VGA (48 kHz) for the adjustments.

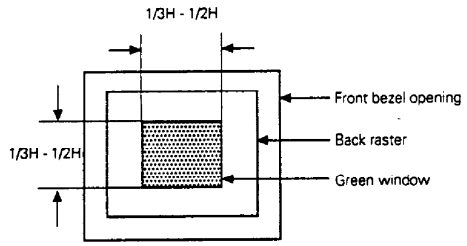
4-1. Adjustment of video amplitude and white balance of back raster

Locate VR101(R-Gain), VR121(G-Gain), VR141(B-Gain) controls on the main PWB to mechanically center position.
Locate VR102(R-Bias), VR122(G-Bias), VR142(B-Bias) controls on the video PWB to mechanically center position.

4-2. Video Contrast Adjustment

Adjust of gain control (48kHz)
(White window pattern)

1) Display the green window pattern(within a range for which the ABL circuit does not active even though maximum contrast is set) preferably with a video range of 1/3 to 1/2H and 1/3 to 1/2V.



2) Turn the contrast and the brightness controls fully clockwise.

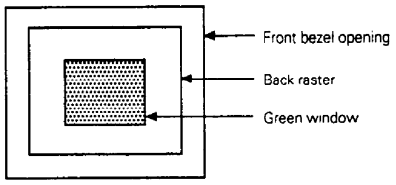
3) Adjust the screen VR of FBT so that the brightness of back raster is to be 0.5 to 1.5 Ft/L. (Typically 1.0 Ft/L)

4) Adjust the VR102(R-Bias), VR142(B-Bias) so that the back raster color is white.

5) Adjust the G-Gain control (VR121) so that the brightness of the green window is to be 38 ±1 Ft/L.

4-3. Adjustment of White Balance of Video

1) Display a full white pattern.



2) Turn the contrast and the brightness controls fully clockwised.

3) Adjust the contrast control so that the brightness of video is to be about 20 Ft/L.

4) Adjust the R-Gain control (VR101) and B-Grain control (VR141) so that the video is to be white.
(X = 0.283 ±0.02, Y = 0.298 ±0.02)

4-4. Fine Adjustment of White Balance

(X=0.283 ±0.02, Y=0.298 ±0.02)
Attention: do not touch VR121(G-Gain)

1) Display the full white pattern.

2) Turn the contrast control so that the brightness of video is to be about 5 Ft/L.

3) And check whether the white coordinate of video meets the above coordinate spec or not.

4) For the contrast control so that the brightness of video is about 20 Ft/L.

5) Check whether the white coordinate of video satisfy above spec or not.

6) If the white balance is off for the above spec, re-adjustment must be done. (Following procedure again)

5. Focus Adjustment

1) Display the character pattern so that adjust the focus can be done. (the highest resolution is recommended)

2) Turn the contrast and the brightness controls fully clockwised.

3) Adjust the focus control of FBT so that the focus is to be the best condition.

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6. Purity Adjustment

1) Be sure that the display is not exposed to any external magnetic fields.

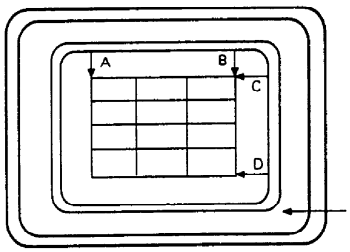
2) Ensure that the spacing between the purity convergence magnet (PCM) assembly and the CRT stem is 29mm ± 1mm

3) Produce a complete, red pattern on display. Adjust the purity magnet rings on the PCM assembly to obtain a complete field of the color red. This is done by moving the two tabs in such a manner that they advance is an opposite direction but at the same time to obtain the same angle between the two tags, which should be approximately 180°.

4) Check the complete blue and complete green patterns to observe their respective color purity. Make minor adjustment is needed.

7. CRT Tilt Adjustment

Reassembly the CRT with fastening screws so that the dimension A, B and C, D are separately equal.



8. Static(Center) Convergence

Switch the monitor on and warm up for 15 minutes. Operate the computer in such a way that the cross hatch pattern is displayed on screen. Convergence error should not be over than following table.

Position	Error In (mm)	CRT Dot pitch
Center	0.3	0.28
Corner	0.4	0.28

Proceed as follows:

1) Locate the pair of four pole magnet rings.

2) Rotate the individual rings (change spacing between tabs) to converge the vertical red and blue lines.

3) Rotate the pair of rings (maintaining spacing between tabs) to converge the horizontal red and blue lines.

4) After completing the red and blue center convergence, locate the pair of six pole magnet ring.

5) Rotate the individual rings (change spacing between tabs) to converge the vertical red and blue (magneta) and green lines.

6) Rotate the pair of rings (maintaining spacing between tabs) to converge the horizontal red and blue (magenta) and green lines.

7) Magnet position is 4pole / 6pole / 2pole (from the front of CRT).

8) Don't rotate the 2pole magnet because it's object is to adjust the purity.

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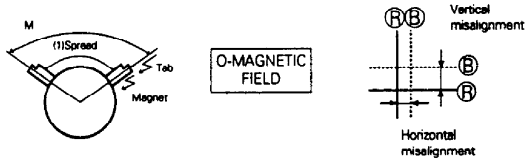
9. Dynamic Convergence

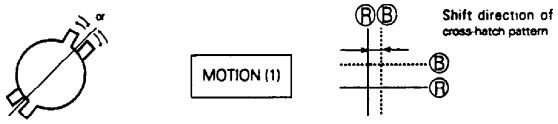
Dynamic convergence (convergence of the three color fields at the edge of the CRT screen) is accomplished by the proper insertion and positioning of the three wedges between the edge of deflection yoke and the funnel of the CRT.

9-1. Alignment of (R) and (B) with the 4pole magnet

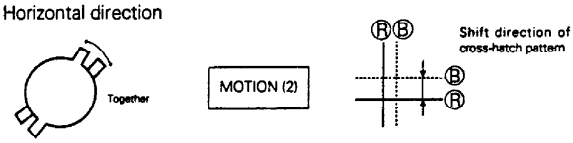
Movable in spread condition



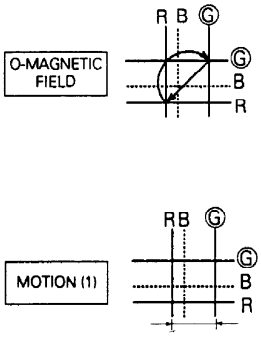
Vertical direction



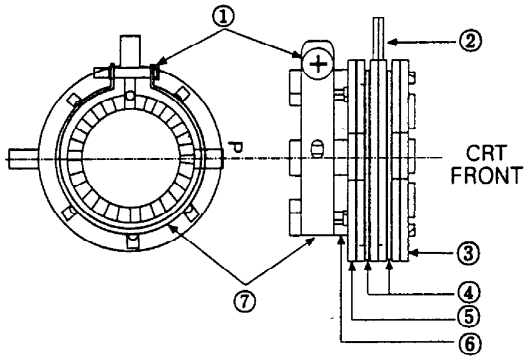
Horizontal direction



9-2. Alignment of (R) and (B) with (G) (6 pole magnet)



※ **Convergence Purity Magnet**



① Setup Bolt ② 4 pole Magnet ③ Purity Magnet (2 pole Magnet)
④ Spacers ⑤ 6 pole Magnet ⑥ Holder ⑦ Band

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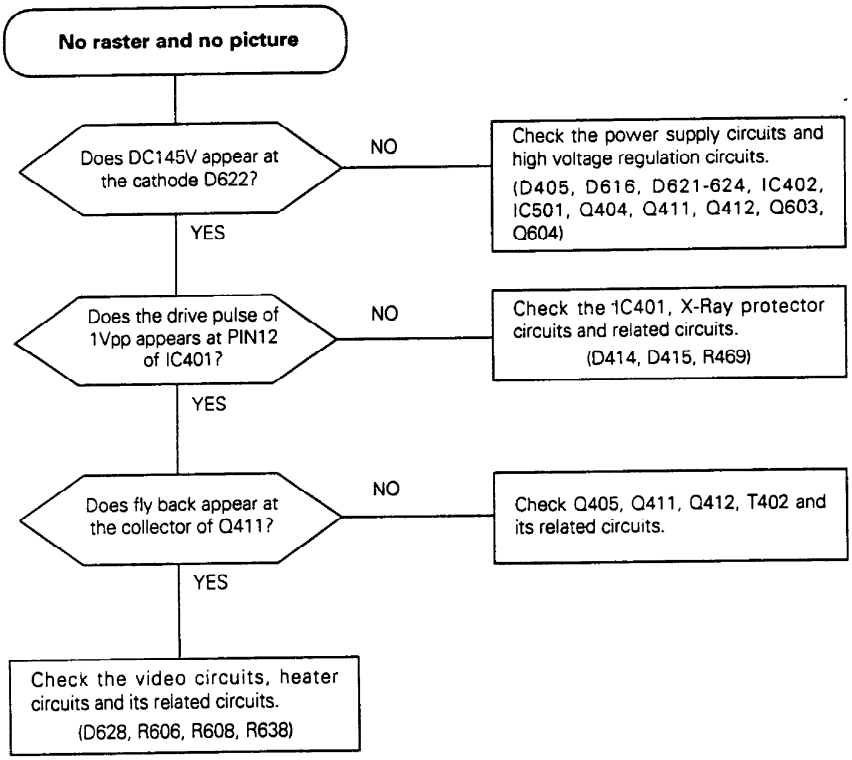
TROUBLESHOOTING GUIDE

Note :

1. If picture does not appear, fully rotate the brightness and contrast control clockwise before inspection.
2. Circuit to be checked
   - ① No raster appears : Power circuits, Horizontal output circuits
   - ② A high voltage develops but no raster appears : Video output circuits
   - ③ A high voltage is not developed : Horizontal output circuits.


No raster and no picture
Does DC145V appear at the cathode D622?
NO
Check the power supply circuits and high voltage regulation circuits.
(D405, D616, D621-624, IC402, IC501, Q404, Q411, Q412, Q603, Q604)
YES
Does the drive pulse of 1Vpp appears at PIN12 of IC401?
NO
Check the IC401, X-Ray protector circuits and related circuits.
(D414, D415, R469)
YES
Does fly back appear at the collector of Q411?
NO
Check Q405, Q411, Q412, T402 and its related circuits.
YES
Check the video circuits, heater circuits and its related circuits.
(D628, R606, R608, R638)

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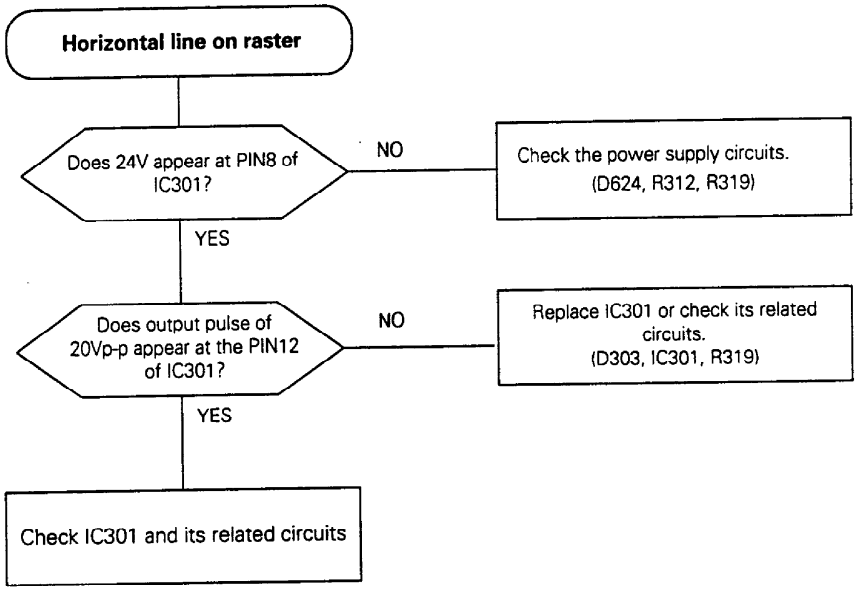
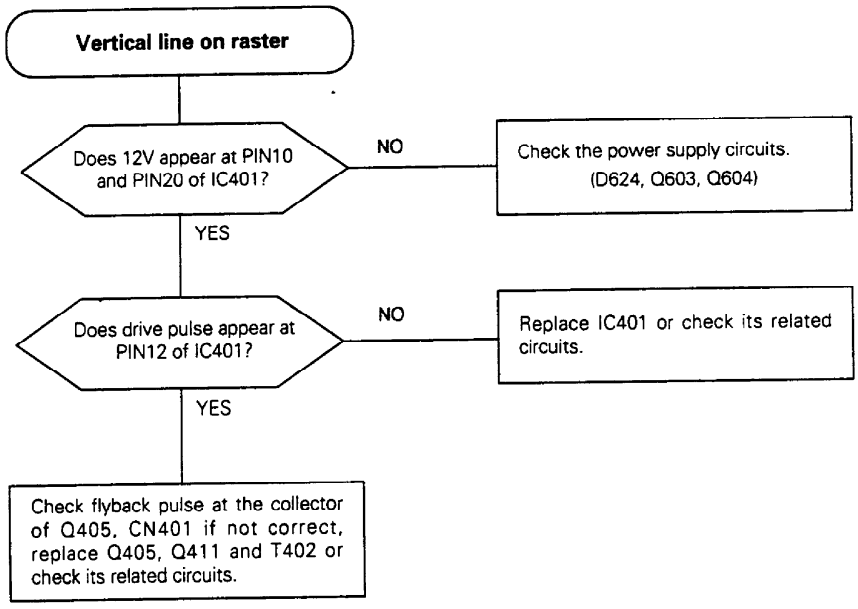

Horizontal line on raster
Does 24V appear at PIN8 of IC301?
NO
Check the power supply circuits. (D624, R312, R319)
YES
Does output pulse of 20Vp-p appear at the PIN12 of IC301?
NO
Replace IC301 or check its related circuits. (D303, IC301, R319)
YES
Check IC301 and its related circuits


Vertical line on raster
Does 12V appear at PIN10 and PIN20 of IC401?
NO
Check the power supply circuits. (D624, Q603, Q604)
YES
Does drive pulse appear at PIN12 of IC401?
NO
Replace IC401 or check its related circuits.
YES
Check flyback pulse at the collector of Q405, CN401 if not correct, replace Q405, Q411 and T402 or check its related circuits.

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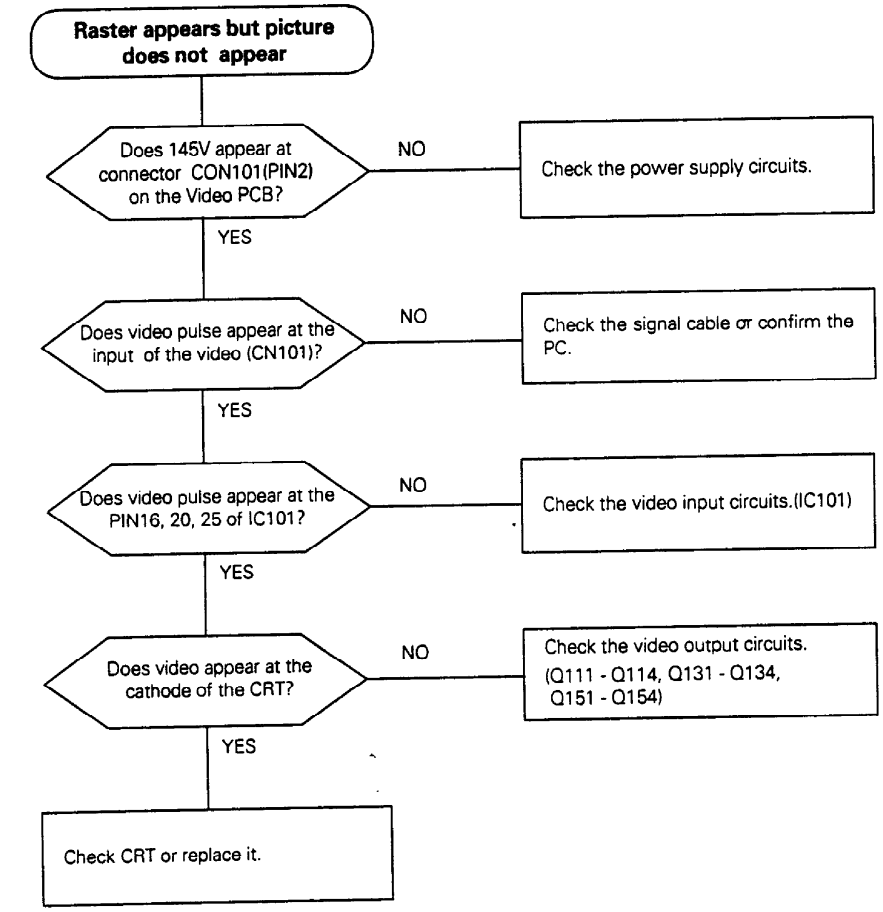
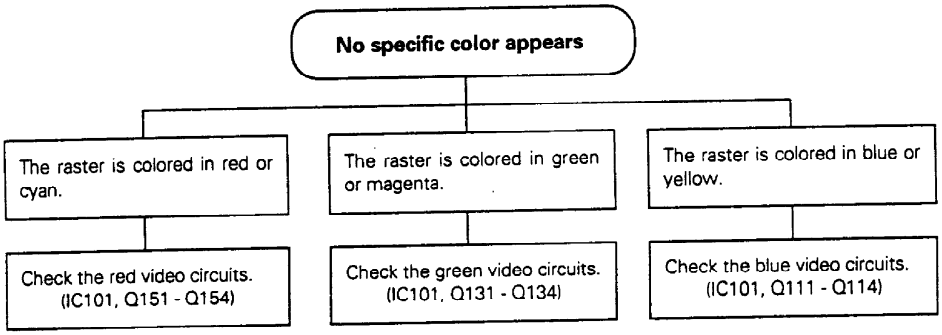

Raster appears but picture does not appear
Does 145V appear at connector CON101(PIN2) on the Video PCB?
NO
Check the power supply circuits.
YES
Does video pulse appear at the input of the video (CN101)?
NO
Check the signal cable or confirm the PC.
YES
Does video pulse appear at the PIN16, 20, 25 of IC101?
NO
Check the video input circuits.(IC101)
YES
Does video appear at the cathode of the CRT?
NO
Check the video output circuits. (Q111 - Q114, Q131 - Q134, Q151 - Q154)
YES
Check CRT or replace it.


No specific color appears
The raster is colored in red or cyan.
The raster is colored in green or magenta.
The raster is colored in blue or yellow.
Check the red video circuits. (IC101, Q151 - Q154)
Check the green video circuits. (IC101, Q131 - Q134)
Check the blue video circuits. (IC101, Q111 - Q114)

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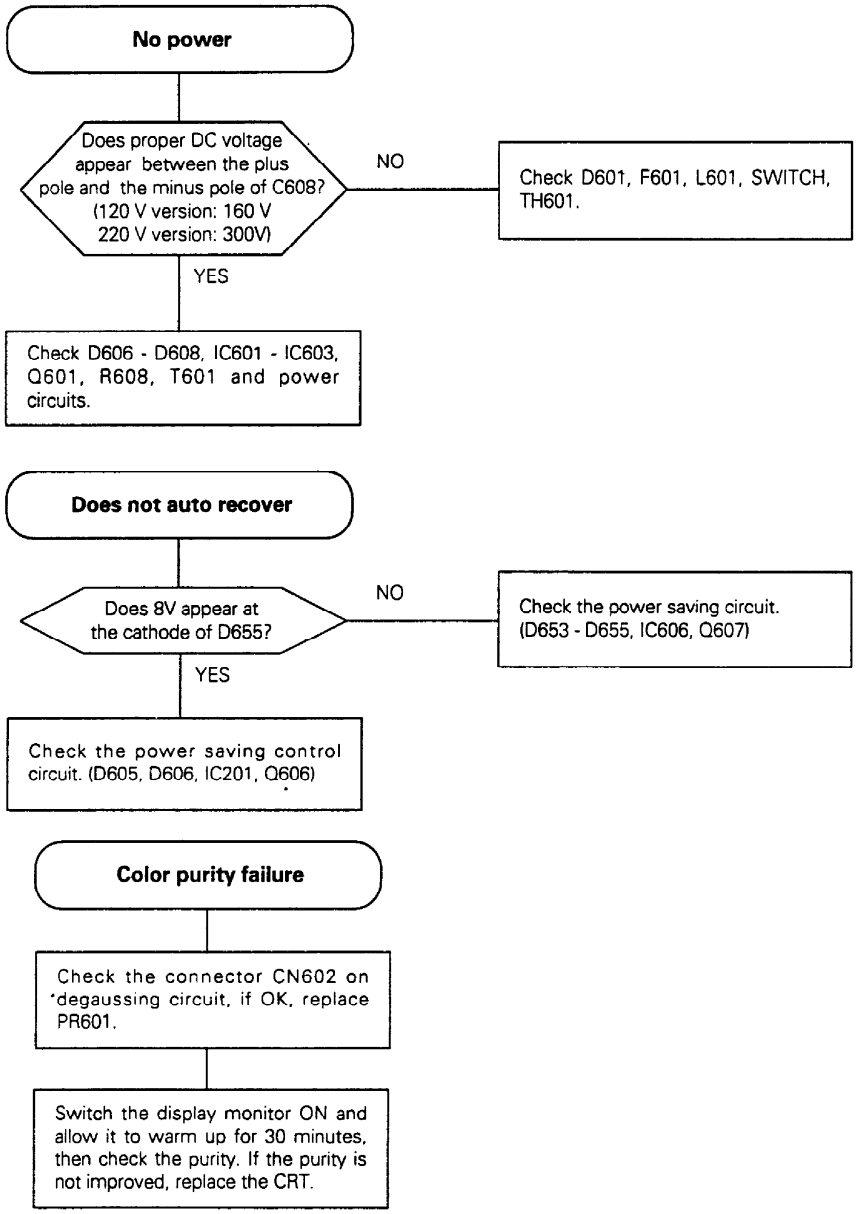
No power
Does proper DC voltage appear between the plus pole and the minus pole of C608? (120 V version: 160 V 220 V version: 300V)
NO
Check D601, F601, L601, SWITCH, TH601.
YES
Check D606 - D608, IC601 - IC603, Q601, R608, T601 and power circuits.
Does not auto recover
Does 8V appear at the cathode of D655?
NO
Check the power saving circuit. (D653 - D655, IC606, Q607)
YES
Check the power saving control circuit. (D605, D606, IC201, Q606)
Color purity failure
Check the connector CN602 on degaussing circuit, if OK, replace PR601.
Switch the display monitor ON and allow it to warm up for 30 minutes, then check the purity. If the purity is not improved, replace the CRT.

Note: If color purity is not normal, manual degaussing should be done by mandatory methode using the manual degaussing coil before inspection.

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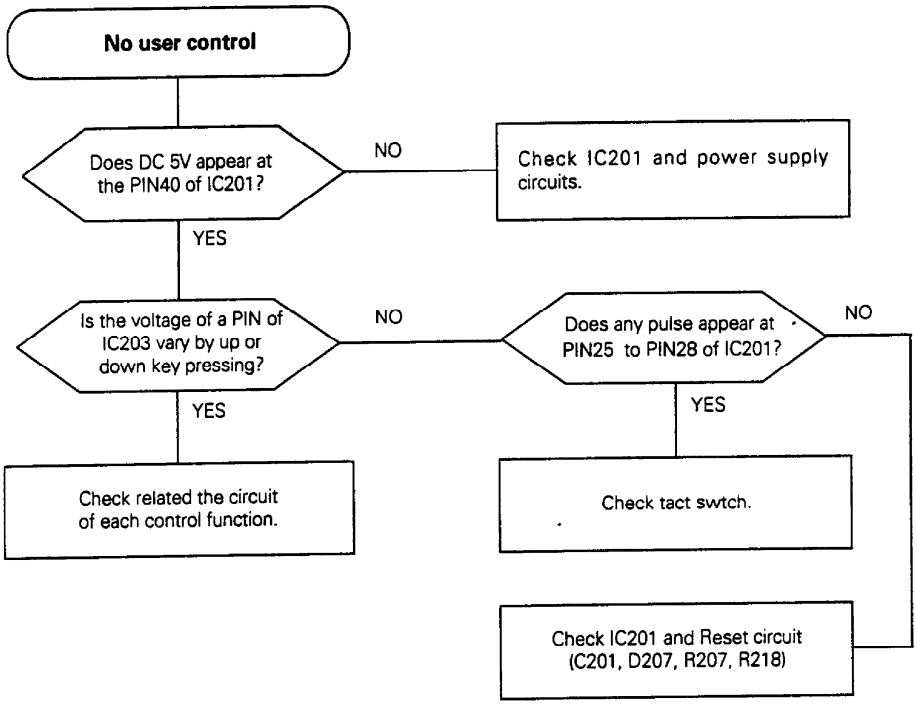
No user control
Does DC 5V appear at the PIN40 of IC201?
NO
Check IC201 and power supply circuits.
YES
Is the voltage of a PIN of IC203 vary by up or down key pressing?
NO
Does any pulse appear at PIN25 to PIN28 of IC201?
NO
YES
YES
Check related the circuit of each control function.
Check tact swtch.
Check IC201 and Reset circuit (C201, D207, R207, R218)

Note: If Save function does not operate, check IC203 (EEPROM)
Measure the voltage of IC203 when you push Up button or Down button.

Function	Pin No.	Control Range (Voltage at a PIN)	Remark
Horizontal Position	12	(X-3)V - (X+3)V	The "X" means the value which has been setted in the factory preset mode. (Refer to Page 5-1, 5-2)
Vertical Position	15	0V - 12V	
Horizontal Size	13	0V - (X+3)V	
Vertical Size	4	(X-3)V - (X+3)V	
Side Pincushion	14	(X-3)V - (X+3)V	
Parallelogram	6	(X-3)V - (X+3)V	
Trapezoid	5	(X-3)V - (X+3)V	

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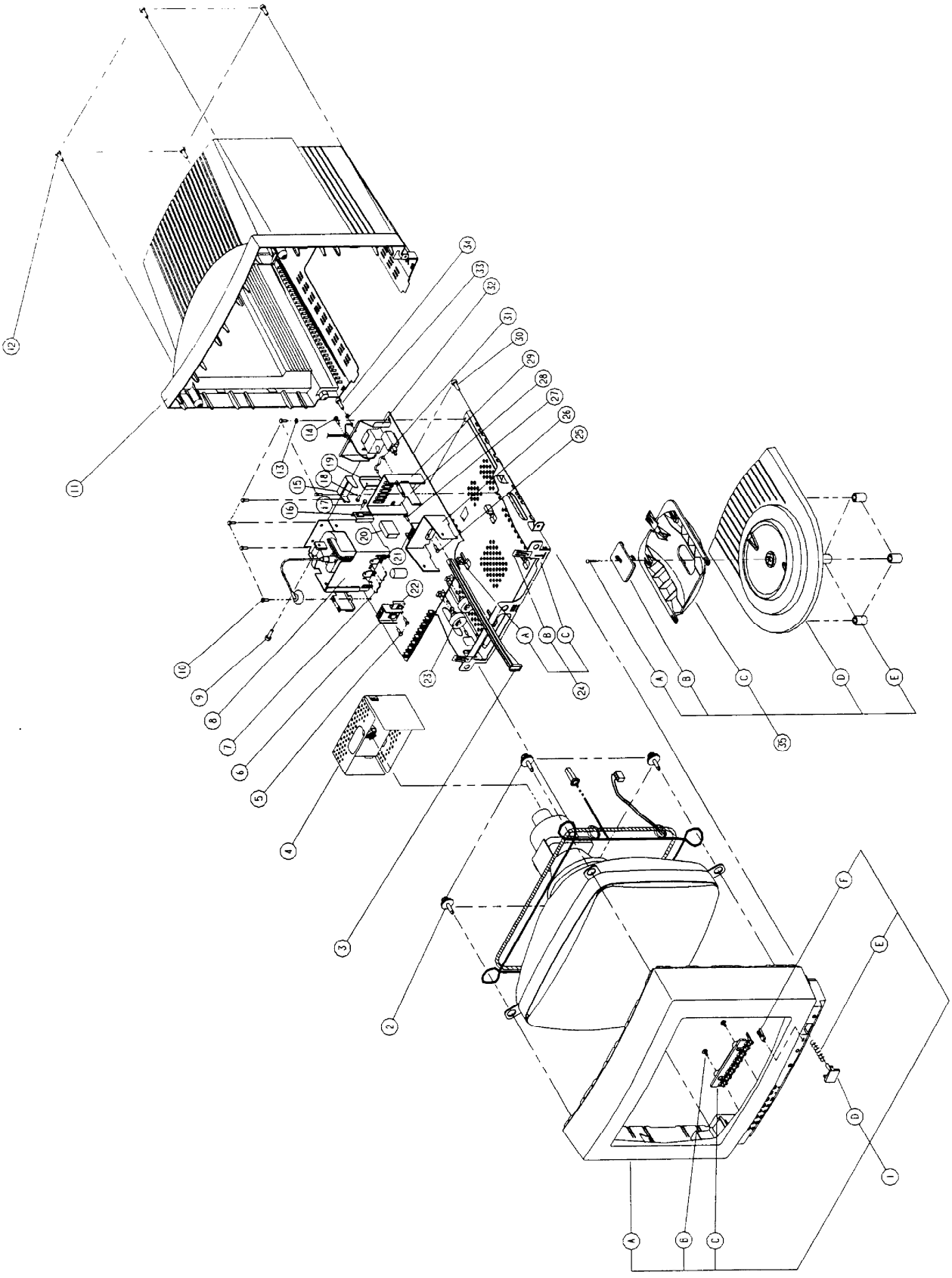

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EXPLODED VIEW AND PARTS LIST

NO	DESCRIPTION	CODE NO.	SPECIFICATION	Q'TY	REMARK
1	COVER/FRONT ASSY	811 468017AF	CSN5987	1	
A	COVER FRONT	821 460342AF	ABS V0 VH-0800S #C7262	1	
B	SCREW TAPTITE	847 502005AB	B,BH,+,M4,L12,ZPC3,SWCH	2	
C	KNOB FUNCTION	821 469097AA	ABS V0 VH-0800S #C7262	1	
D	KNOB POWER	821 469098AA	ABS V0 VH-0800S #C7262	1	
E	SPRING COIL	831 522033AJ	SUS-304 WPA	1	
F	LENS LED	821 468251AA	ACRYL CLEAR	1	
2	TAPPING, CRT	842 840022BA	BH,+,1,M5,L30,ZPC3,2/2,W/W	4	
3	SHAFT POWER	821 468238AA	PBT G30% V0 NTR	1	
4	SHIELD-CRT, PCB	813 464199AA	SPTE T0.2	1	
5	SCREW TAPTITE	847 501007EG	B,BH,+,M3,L8,ZPC3,SWCH	2	
6	H/SINK-TR	831 511012AC	A6063 EXTR H35	1	
7	SPRING-TR	813 468062AC	SUS-304 1/2H 0.17/T0.5	2	
8	H/SINK-FBT	831 514509AA	A1050S H14 T1.0	1	
9	SCREW-TAPTITE	847 501007FC	B,BH,+,M4,L16,ZPC3,SWCH	1	
10	SCREW-TAPTITE	847 502005AA	B,BH,+,M3,L10,ZPC3,W/W	6	
11	COVER-REAR	821 460334AA	ABS V0 VH-0800S #C7262	1	
12	SCREW-TAPTITE	847 501007FC	B,BH,+,M4,L16,ZPC3,SWCH	4	
13	SPRING-WASHER	855 124001BB	M4,ID4.1,OD7.6,T1,ZPC3	1	
14	SCREW-TAPTITE	847 502005AA	B,BH,+,M3,L10,ZPC3,W/W	1	
15	SHIELD D-SUB	813 464193AA	SPTE T0.5	1	
16	H/SINK-TR	831 513021AA	SPC-1 T1.0	1	
17	SCREW-TAPTITE	847 501007EG	B,BH,+,M3,L8,ZPC3,SWCH	1	
18	H/SINK-TR	831 513023AC	SPC-1 T1.0	1	
19	SCREW-TAPTITE	847 502005AA	B,BH,+,M3,L10,ZPC3,W/W	1	
20	SHIELD-H, IC	813 464202AA	SPTE T0.5	1	
21	H/SINK-TR	831 513012AC	A6063 EXTR H35	1	
22	H/SINK-TR	831 513021AA	SPC-1 T1.0	1	
23	KNOB-CONTROL	831 171037BC	ABS V0 VH-0800D #C7262	2	
24	CHASSIS-ASSY	811 466021AA	CSQ4387	1	
A	RUBBER SUPPORT	821 468248AA	NEOPRENE V0 GRAY	2	
B	EARTH-PLATE	815 462021AA	PBS 3/4H T0.2	2	

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EXPLODED VIEW AND PARTS LIST

NO	DESCRIPTION	CODE NO.	SPECIFICATION	Q'TY	REMARK
C	CHASSIS BOTTOM	813 466084AA	SECC-1 T1.0	1	
25	SCREW TAPTITE	847 501007EG	B,BH,+,M3,L8,ZPC3,SWCH	1	
26	H/SINK-V,IC	831 513523CA	A1050S H14 T2.0	1	
27	SCREW-TAPTITE	847 501007EG	B,BH,+,M3,L8,ZPC3,SWCH	1	
28	BRACKET-PCB	813 460278AA	SECC-1 T0.8	2	
29	H/SINK-POWER	831 513523DA	A1050S H14 T1.6	1	
30	SCREW-TAPTITE	847 501007FC	B,BH,+,M4,L16,ZPC3,SWCH	2	
31	SPRING-TR	813 468062AC	SUS-304 1/2H 0.17/T0.5	1	
32	BRACKET-POWER	813 460277AB	SECC-1 T0.8	1	
33	SPRING-WASHER	855 124001BB	M4,ID4.1,OD7.6,T1,ZPC3	1	
34	SCREW-TAPTITE	847 501007FA	S,BH,+,M4,L10,ZPC3,SWCH	1	
35	STAND-ASSY	811 460043AC	CSN5987	1	
A	SCREW-TAPTITE	847 502005AC	B,BH,+,M3,L16,ZPC3,W/W	1	
B	STAND-STOPPER	821 463085AB	STAROY VB-1108R G8117	1	
C	STAND-TOP	821 463092AD	ABS V0 VH0800S C7262	1	
D	STAND-BASE	821 463091AA	ABS V0 VH0800S C7262	1	
E	RUBBER-FOOT	831 313024AB	NEPORENE V1 BGE	4	

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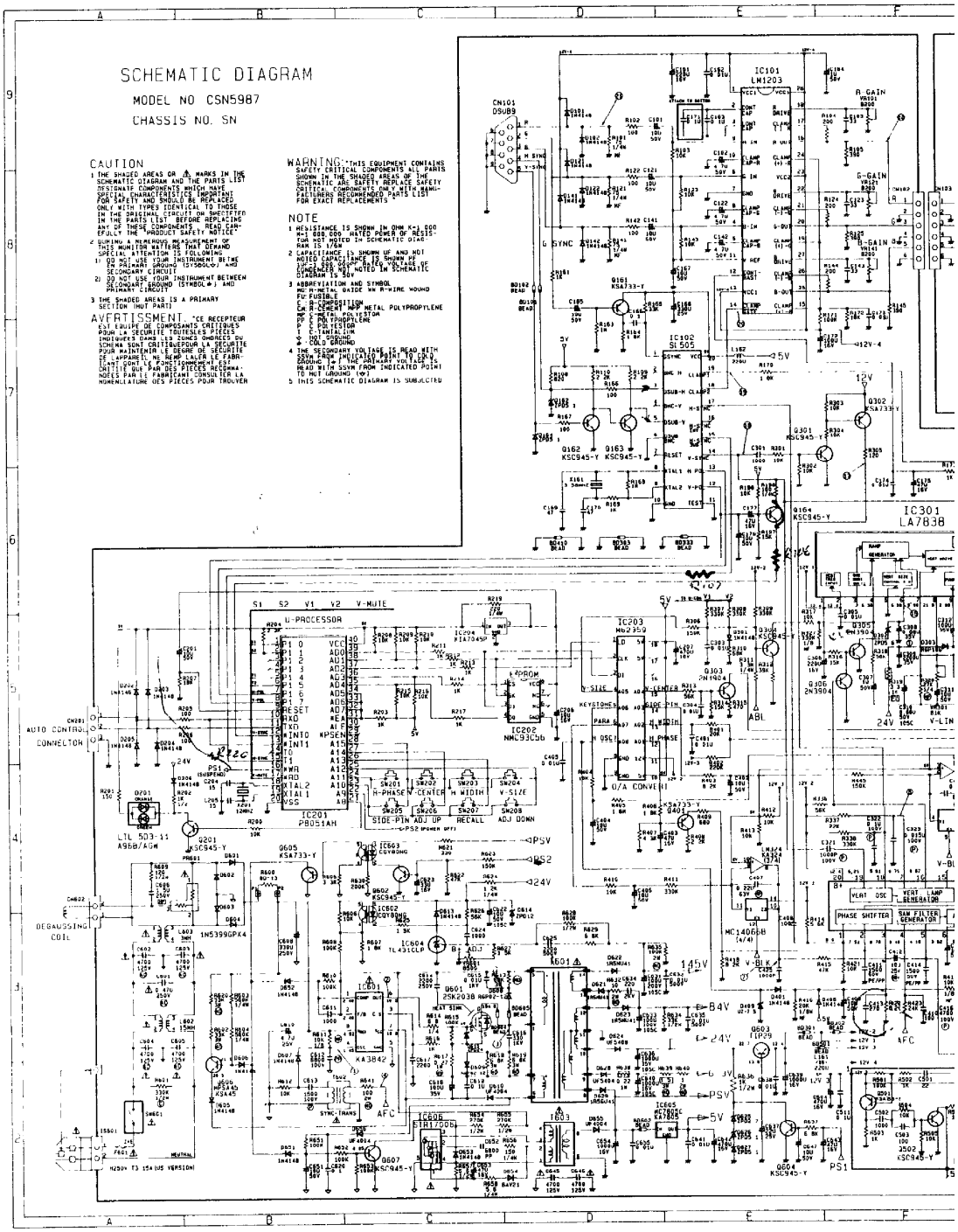

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